

Application No. 10/714,277
Reply to Office Action of March 28, 2006

REMARKS

Claims 1-3, 5-7, 9-11, 13-16 and 21-34 are pending. Claims 4, 8, 12 and 17-20 were previously canceled. Claims 1, 13, 16, 21, 23-25, 27, 29-31 and 33-34 have been amended.

No new matter was entered. Supporting descriptions for the new claim limitations in the amended independent claims 1, 13, 21 and 27 can be seen, for example, in paragraphs [0037] to [0040] by reference to Figures 2, 2A and 2B. Reconsideration of this application is respectfully requested in view of the foregoing amendments and the following remarks.

Rejection under 35 U.S.C. § 103(a)

Claims 1-3, 5-7, 9-11, 13-16 and 21-34 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kwon et al. (U.S. Publication 2004/0219715) in view of Farnworth et al. (U.S. Patent No. 6,333,555).

Furthermore, Claims 1-3, 5-7, 9-11, 13-15 and 21-26 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Kobayashi (U.S. Publication 2003/0183933) in view of Farnworth.

Applicants respectfully traverse all of these rejections for at least the reasons set forth below.

1. Prior art references

(1) Kwon:

Referring to FIGs. 6 and 9 of Kwon, Kwon is directed to a bump 200 of a semiconductor chip 100. The bump 200 includes a conductive packing metal 220 contacting a metal pad 180 formed on a surface of the semiconductor chip 100, a conductive capping metal 230 formed on the conductive packing metal 220, and a sidewall insulating layer 210 surrounding the sidewalls of the metals 220 and 230. The packing metal 220 comprises a material having good contact resistance and bonding properties with the metal pad 180. (See, for example, paragraphs [0027] to [0029] by reference to FIG. 1).

(2) Kobayashi:

Kobayashi is directed to a semiconductor chip that comprises a bump electrode 100 formed over a main surface of the chip. The bump electrode 100, which is made of Au or Cu,

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etc., has at least one protrusion 101 on a top surface thereof. The protrusion 101 is higher than a peripheral portion 10b, where an inner lead is placed. (See, for example, paragraph [0034] and FIG 1).

(3) Farnworth:

Farnworth discloses a polymer contact member 26 adapted to electrically engage a corresponding contact 22 formed on a semiconductor component 24. A conductive layer 34 covers the polymer contact member 26 to provide an electrically conductive surface for contacting the contact 22. (See, for example, col. 5, lines 21-25 and FIG 3).

2. Patentability of amended independent claims 1 and 13 over Kwon in view of Farnworth

Each of the amended claims 1 and 13 recites, in part, the following limitations:

a plurality of bumps provided on the substrate, each of the plurality of bumps being electrically insulative and having an upper surface, a pair of sidewalls, an outer wall facing away a center portion of the substrate and an inner wall facing towards the center portion of the substrate and connected to the outer wall by the pair of sidewalls;

a conductive layer provided over each of the plurality of bumps extending from the upper surface to the circuits;

wherein the conductive layer is absent from at least one of the pair of sidewalls of each of the plurality of bumps" (underlining added for emphasis)

Referring to Fig. 2A, the conductive layer 64 is formed over the electrically insulative bump-forming layer 66 and electrically contacts the under-bump metal 60, which in turn is in electrical contact with an IC through the bond pad 58. Referring to Fig. 10, one purpose of the absence of the conductive layer 64 from at least one of the pair of sidewalls 68 is to electrically isolate adjacent bumps when an anisotropic conducting film 92 is applied.

In contrast to the amended claims 1 and 13, Kwon does not have a structure analogous to the microelectronic structure as claimed. Referring to exemplary FIG 9 of Kwon, the packing metal layer 220 is not electrically insulative. Furthermore, the capping metal layer 230 only extends on an upper surface of the packing metal layer 220, and does not extend from the upper surface to the pad 180 of the chip 100.

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Also, in contrast to the amended claims 1 and 13, Farnworth does not have a structure analogous to the microelectronic structure as claimed. Referring to FIGs. 1F and 2C of Farnworth, the conductive layer 34 entirely covers the contact member 26 and is not absent from at least one of the pair of sidewalls of the contact member 26.

Farnworth fails to cure the deficiencies of Kwon in view of the amended claims 1 and 13 for at least the following reasons. Firstly, if the packing metal 220 of Kwon is replaced by the polymer contact member 26 of Farnworth, the capping metal 230 will be no longer in electrical contact with the pad 180. Secondly, the bump 200 of Kwon is to be electrically connected at the capping metal 230 to a connection pad 480 (FIG 9) through the conductive particles of a film 350. The insulating layer 210 surrounding the sidewalls of the packing metal 220 and the capping metal 230 electrically isolate one bump from another. The polymer contact member 26 of Farnworth, however, is to be directly engaged with the contact 22 (FIG 3) or a contact 22A (FIG 3A) at a tip portion 32, or electrically connected to a contact 22A (FIG 3B) at a sidewall portion together with an adjacent polymer contact member. Either way, no film is necessarily required or suggested in Farnworth. A base reference cannot be modified if doing so would destroy its intended manner of operation as stated in MPEP 2143.01. The Examiner's proposed modification to Kwon would clearly destroy Kwon's intended manner of operation and thus is improper.

Therefore, neither Kwon nor Farnworth individually or in combination discloses or suggests each and every element of the amended independent claims 1 and 13. Moreover, neither Kwon nor Farnworth provides a motivation to combine with each other that discloses or suggests each and every element of the amended independent claims. Accordingly, the amended independent claims 1 and 13 are patentable over Kwon and Farnworth.

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3. Patentability of amended independent claims 21 and 27 over Kwon in view of Farnworth

Each of the amended claims 21 and 27 recites, in part, the following limitations:

a plurality of bumps formed on the substrate, each of the plurality of bumps being electrically insulative and having an upper surface and a side surface; and

a conductive layer formed over each of the plurality of bumps extending from the upper surface to the circuits, exposing at least one portion of the side surface of each of the plurality of bumps (Underlining added for emphasis)

As discussed above, the packing metal layer 220 is not electrically insulative.

Furthermore, neither the conductive layer 64 in Kwon, nor the conductive layer 34 in Farnworth, expose at least a portion of a side surface of their respective bumps. Accordingly, the amended claims 21 and 27 are believed to be patentable over Kwon and Farnworth.

4. Patentability of amended independent claims 1 and 13 over Kobayashi in view of Farnworth

In contrast to the amended claims 1 and 13, Kobayashi does not have a structure analogous to the microelectronic structure or semiconductor package as claimed. Referring to exemplary Fig. 3a, the bump electrode 100, made of Au or Cu, is not electrically insulative. Furthermore, the inner lead 1 extends on an upper surface of the bump electrode 100 between protrusions 101 (Fig. 3b), and does not extend from the upper surface to a pad 13 (Fig. 2b). Kobayashi is not cured by Farnworth in view of the amended independent claims 1 and 13. If Farnworth's polymer contact member 26 is moved into Kobayashi's bump electrode 100, the polymer contact member 26 would completely destroy the intended manner of operation of Kobayashi's structure because the polymer contact member 26 would no longer be able to allow an electrical contact with the pad 13 through a metal layer 7 (Fig. 2b of Kobayashi). It may be possible to further reconstruct Kobayashi so as to not lose this functionality, but this would require an impermissible re-engineering of Kobayashi's structure.

Applicants respectfully submit that neither Kobayashi nor Farnworth individually or in combination discloses or suggests each and every element of the amended independent claims. Moreover, neither Kobayashi nor Farnworth provides a motivation

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to combine with each other that discloses or suggests each and every element of the amended independent claims. Accordingly, the amended independent claims 1 and 13 are patentable over Kobayashi and Farnworth.

5. Patentability of amended independent claim 21 over Kobayashi in view of Farnworth

Based on a similar rationale as above provided for the amended claims 1 and 13, Applicants respectfully submits that Farnworth fails to cure the deficiencies of Kobayashi in view of the amended independent claim 21. Accordingly, the amended claim 21 is believed to be patentable over Kwon and Farnworth.

6. Patentability of dependent claims

The dependent claims are believed to be patentable because they depend from allowable independent claims and because they recite additional patentable features.

Conclusion

Insofar as the Examiner's rejections were fully addressed, the instant application, including claims 1-3, 5-7, 9-11, 13-16 and 21-34, is in condition for allowance. A Notice of Allowability of all pending claims is therefore earnestly solicited.

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Respectfully submitted,

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